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GUIDE

TO THE

BRITISH MYCETOZOA

EXHIBITED IN THE

*DEPARTMENT OF BOTANY,*

BRITISH MUSEUM (NATURAL HISTORY).

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PRINTED BY ORDER OF THE TRUSTEES.

1895.

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GUIDE

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EXHIBITED IN THE

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BY

ARTHUR LISTER, F.L.S.

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15/5/96.

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## P R E F A C E.

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THE collection of British Mycetoza, and the series of coloured drawings explaining their structure, exhibited in the Botanical Gallery, have been presented by Mr. Arthur Lister, the author of this Guide. All known British Mycetoza are described briefly, and it is hoped that this account will serve as an introduction to the systematic study of the group.

In preparing his *Monograph of the Mycetoza*, based on the collection in the British Museum, Mr. Lister generously enriched the national herbarium by the gift of numerous specimens which had the special value of having been named after comparison with type specimens in the herbaria of the Royal Gardens, Kew ; the Royal Botanic Gardens, Edinburgh, Strassburg, Paris, Christiania, Leyden ; the collections of Messrs. Phillips and Masee, in this country, and with specimens furnished by Dr. Rex, Prof. Farlow of Harvard University, Prof. Macbride of the State University of Iowa, and Mr. Morgan of Ohio.

For the purpose of ready microscopic examination Mr. Lister also prepared and presented to the Trustees eight hundred and thirty-two mounted slides, illustrating the British Museum collection of Mycetoza, and they are preserved in a cabinet in the Cryptogamic Herbarium for consultation by students.

The present Guide is based on the study of this valuable material, and in its preparation Mr. Lister has had the advantage of the diligent assistance of his daughter, Miss Gulielma Lister, who has also made the coloured drawings exhibited in the case.

GEORGE MURRAY.

ERRATUM.

On page 11, line 10 from bottom, *for* "forms" *read* "walls."

# BRITISH MYCETOZOA.

THE Mycetozoa are a group of organisms which may be placed in the border-land between the Animal and Vegetable Kingdoms. They are characterised by the constant sequence of three main stages in their life history, viz. :—

1. The firm-walled spore gives birth to a *swarm-cell*.
2. The swarm-cells coalesce to form a wandering *plasmodium*.
3. The plasmodium ultimately concentrates to form either *sporangia*, enclosing numerous spores (Endosporeæ), or *sporophores* bearing spores on their outer surface (Exosporeæ).

Many species are quite common, and are found on old decaying stumps and fallen branches in moist woods and shaded gardens ; others inhabit heaps of dead leaves which have lain undisturbed and become soaked with rain. The only stage in which they are con-

spicuous is that of the sporangia, when they appear as minute objects, some roundish, about the size of small mustard seeds, others rising in clusters of brown columns on black hair-like stalks, while many take other characteristic forms. The different species display great variety and beauty in the colours they assume, ranging from pure white, golden yellow, bright crimson, and iridescent violet to dark purple and black.

The various phases in the life history of the group may be described as follows :—

The swarm-cells emerge from the spores as amœboid bodies ; they soon acquire a flagellum at the anterior end, and creep in a linear form with the flagellum extended in advance, or swim in the surrounding water with a dancing

Swarm-cells

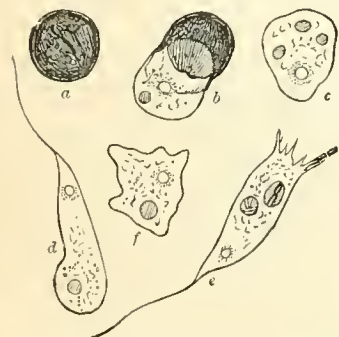


Fig. 1.—*DIDYMIUM DIFFORME* Duby.

- a. Spore.
  - b. Swarm-cell escaping from the spore-case.
  - c. Newly hatched swarm-cell containing a nucleus and three vacuoles.
  - d. Flagellated swarm-cell.
  - e. Swarm-cell, with two vacuoles containing bacteria, and produced at the posterior end into pseudopodia, to one of which a bacterium is attached.
  - f. Amœboid swarm-cell.
- Magnified 720 times.

motion occasioned by the lashing movement of the flagellum. They possess a single *nucleus* and a *contractile vacuole*. To a large extent the swarm-cells feed on bacteria, which are caught by *pseudopodia* projected from the posterior end of the body. The bacteria are conveyed into the body-substance, where they are digested in vacuoles which form round them; there may be one or more digestive vacuoles, each containing several bacteria at one time. The swarm-cells rapidly increase in number by bipartition. When this takes place the flagellum is first withdrawn, and the swarm-cell assumes a globular form; it then elongates, and a constriction occurs at right angles to the long axis. Meanwhile the nucleus is passing through the process of division by karyokinesis, and in the course of a few minutes the two halves of the nuclear plate separate and retreat to the opposite ends of the constricted cell, which now

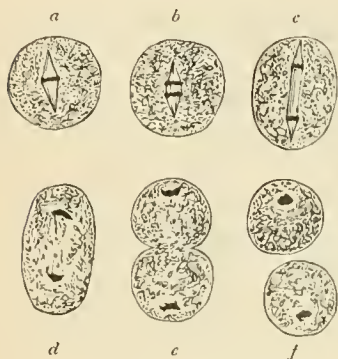


Fig. 2.—*AMAUROCHETE ATRA* Rost.

*a* to *f*. Successive stages in bipartition of swarm-cell, accompanied by the division of the nucleus by karyokinesis. Magnified 1200 times.

Drawn from stained preparations in Canada balsam.



Fig. 3.—*DIDYMIUM DIFFORME* Duby.

Young plasmodium, with attendant amœboid swarm-cells, some of which have turned into microcysts (*m*): one microcyst is being digested in a vacuole (*v*). An empty spore-shell is shown at *s*. Magnified 470 times.

divides into two; each segment soon acquires a flagellum, and resumes the former active state.

#### Microcysts.

In all cultivations of germinating spores a number of the swarm-cells, after a short time of activity, become encysted in a globular form as *microcysts*. In this state they may remain dry for several days, but on water being added the cyst-wall is ruptured and the contents creep out and assume again the motile condition. Frequently the entire group of swarm-cells will change to microcysts, and reawaken in the course of two or three days while still immersed in water. A few days after the germination of the spores, the process of bipartition, by which the number of the swarm-cells has greatly increased, ceases. The majority now withdraw the flagellum, and adopt true amœboid movements. These amœboid

#### Plasmodium.

bodies collect in clusters, and coalesce to form plasmodia, which may

be described as masses of naked protoplasm abounding in nuclei and more or less coloured granules. The nuclei at this early stage appear to be those of the individual swarm-cells which have fused together. Careful investigations lead to the conclusion that the vast multiplication of nuclei which takes place during the growth of the plasmodium results from simple division. Apparently one instance only of division by karyokinesis in this stage of the plasmodium has been recorded, and of this observation permanent preparations are preserved (Fig. 5). As the plasmodium increases in bulk by the ingestion of nutritive matter and by the union of small plasmodia, it acquires the remarkable streaming movement peculiar to itself. In the majority of species the plasmodium is white, but there are many in which it is yellow, and in some it is greenish, pink or purple. It penetrates the substance of dead wood or spreads over the surface of dead

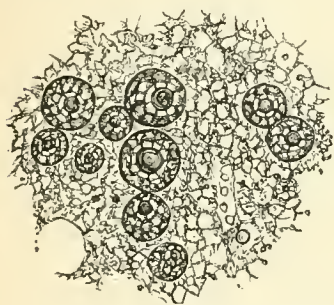


Fig. 4.—*BADHAMIA UTRICULARIS* Berk.

Group of nuclei from actively feeding plasmodium that covered two piles of *Auricularia* in fourteen hours, showing the irregular size of the nuclei and large nucleoli.

Stained in picro-carmin and mounted in Canada balsam. Magnified 1200 times.

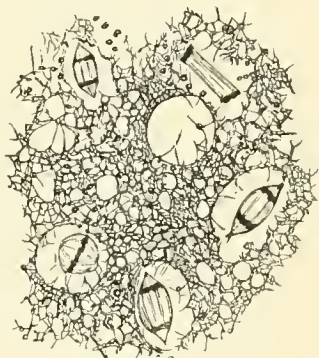


Fig. 5.—*BADHAMIA UTRICULARIS* Berk.

Division of nuclei by karyokinesis in the streaming plasmodium. Magnified 1200 times.

From a preparation stained in safranin, and mounted in Canada balsam. †

leaves, bark, etc., in a network of veins, taking a somewhat fan-shaped outline; through these veins the more fluid matter in the interior streams constantly in a rhythmic flow. The current continues in one direction for a certain period, usually a minute and a half, when it stops, and after a moment's pause reverses its course, flowing the opposite way for about the same length of time, but rather longer in the direction in which the mass is advancing. It is by this means that the plasmodium creeps forward. The object of this onward movement appears to be a search for food. If the yellow plasmodium of *Badhamia utricularis*, which feeds on woody fungi, is cultivated on *Stereum hirsutum*, placed on a plate and covered with a glass shade, it extends itself over the fungus with a turgid advancing border until it has devoured the more delicate hyphæ. Having exhausted the nutriment, it will spread over the



plate and the interior of the glass shade. If it is in sufficient quantity, it will in the course of a couple of days cover the glass with a network of veins over an area of perhaps forty or fifty square inches. A piece of fresh *Stereum*, soaked in water, may now be inserted beneath the shade, allowing it to come in contact with one of the smallest veins. In a few hours the whole of the plasmodium will have withdrawn from the sides of the shade, and concentrated itself on the fresh food in a dense yellow mass. The length of time during which the plasmodium will continue to feed and increase in bulk before changing into sporangia differs according to the species, and also to the conditions of its surroundings. *Physarum psittacinum*, which inhabits the rotten stumps of old trees, appears to pass twelve months in the plasmodium stage; on the other hand, *Didymium difforme* will go through the several stages from germination of the spores to the formation of the sporangia in a fortnight. The latter species is very common, and may easily be cultivated. The spores can be sown in water on a thin cover-slip supported over a glass slide by a ring of wet blotting-paper, the required nutriment being supplied by two or three slices of the mucilaginous coat of a garden-cress seed. In this moist chamber the whole process of the division of the swarm-cells, their coalescence to form the plasmodium, and the construction of the sporangia, may be watched under the microscope.

#### Sclerotium.

The plasmodium, if allowed to dry, passes into the sclerotium or resting stage. The sclerotium of *Badhamia utricularis* is dull orange-red in colour, of horny consistence, made up of a multitude of thin-walled cysts closely packed together; each cyst is filled with granular protoplasm, among which ten to twenty nuclei are interspersed. On being wetted the sclerotium will revive in the course of a few hours and resume the streaming movement. Preserved in a dry state, it will retain its vitality for three or four years, but it is longer in reviving according to the length of time it has remained in the resting condition.

#### Sporangium.

The formation of the sporangium may be illustrated by the growth of *Comatricha obtusata*, a common species which is often found on the under side of fir planks that have been left to rot on the ground. When the fruiting period arrives, the watery-white plasmodium issues from the wood at a point favourable to the development of the sporangia, and spreads over an area measuring perhaps half an inch across. After a time the plasmodium is seen to concentrate in thirty or forty centres, and in an hour or two each centre has risen into a pear-shaped body with a narrow base, a dark stalk being just apparent through the translucent white substance. In six hours the black hair-like stalk has grown to its full length, bearing at its summit the young sporangium, consisting of a white globule of viscid plasma with a diameter about one-fifth of the length of the stalk. A pink flush now begins to pervade the sporangium, caused by the formation of the dark flexuose branching threads of



the *capillitium* (referred to afterwards) extending from the *columella* to the circumference. The nuclei in the plasma still present the same appearance as those observed in the streaming plasmodium. In about another hour the nuclei show the beginning of karyokinetic division (Fig. 6); as the process advances the plasma becomes separated in masses of two spores' capacity (Fig. 7); an hour later, and karyokinesis is completed, the nuclei have divided, and the young spores are forming. As the dark spore-walls are produced the colour of the sporangia rapidly changes, and in about twenty hours after the first concentration of the plasmodium they have matured and present the appearance of a cluster of minute black pins, with round or oblong heads, standing in regular order on the wood. The sporangia of different species take various forms, such as are represented by the woodcuts illustrating the different genera,

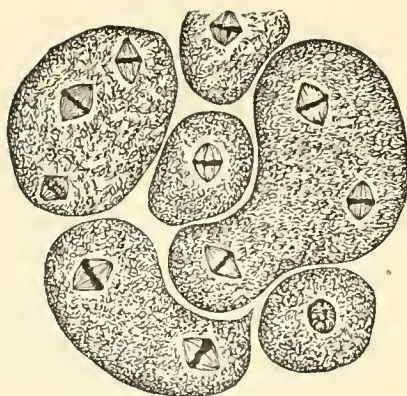


Fig. 6.—*COMATRICHA OBTUSATA* Preuss.

From a stained preparation of a young sporangium, showing the plasmodium separated into rounded masses about groups of nuclei, which are dividing by karyokinesis; the nuclear division has reached the "spindle stage"; the spindles are seen in profile in all cases but one, in which the equatorial plate is seen from one of the poles of the spindle. Magnified 1200 times.

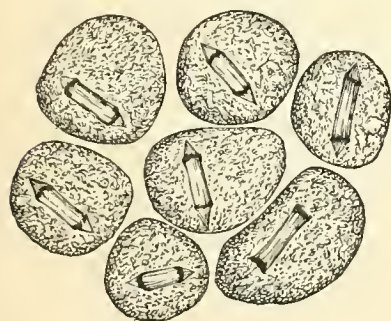


Fig. 7.—*COMATRICHA OBTUSATA* Preuss.

From a stained preparation of a young sporangium, showing the plasmodium separated into masses of two spores' capacity round the nuclei, which have almost divided by karyokinesis. Magnified 1200 times.

base on which the sporangia are seated.

In most genera a *capillitium*, consisting of a system of threads, Capillitium.

with numerous modifications. They may be either symmetrical or irregular in shape, and with or without a stalk; when sessile and of irregular form, as shown in Fig. 13, they have received the name of *plasmodiocarps*.

*Plasmodiocarp.*  
*Æthaliium.*

When many sporangia are combined, and their separating forms are imperfectly developed, the cluster is called an *æthaliium*.

When the sporangia are formed, a membranous or calcareous residuum or *hypothallus* is often left by the plasmodium, forming a

*Hypothallus.*

is found; this is constructed before the spores are formed, and in many species extends from the base of the sporangium, or from an extension of the stalk within the sporangium (the *columella*), to the enclosing wall. It often appears to form a scaffolding, which prevents the shrinking inwards of the sporangium-wall in drying, and thus allows the spores to mature freely and without pressure. The capillitium differs widely in structure in different genera, and is beautifully adapted to assist in the dispersion of the spores on their reaching maturity. In *Trichia* the capillitium threads lie free among the spores, and, being provided with spirally thickened bands which are strongly hygroscopic, twist and writhe with every change of moisture; by this action they separate the spores, so that they are easily carried away by the wind; such free threads are called *elaters*. In *Stemonitis* the capillitium springs from the columella, and extends to the surface of the sporangium, where it forms an enclosing net; the delicate membrane covering the meshes shrivels up on ripening, so that the spores lie in an open-work basket, and are blown by the wind through the openings. In *Arcyria* the capillitium consists of a dense tangle of branching threads, which, when the ripe fruit dries and the delicate sporangium-wall breaks up, expands to many times the original volume, and in so doing scatters the spores on all sides.

Carbonate of lime is usually abundant in the plasmodium and young sporangia of the species comprised in the subcohort *Calcarineæ*. In most genera of the order *Physaraceæ* these granules are withdrawn from the plasma before the spores are formed, and are deposited partly in the sporangium-wall, and partly in vesicular expansions of the capillitium. These expansions take various shapes; they are globose, fusiform, or branched, and are sometimes fused together in the centre of the sporangium, forming a *pseudo-columella*.  
 Lime-knots. In the descriptions of the species they are termed *lime-knots*. In the *Didymiaceæ* the granules in the young sporangia are dissolved at a certain stage, and the salt forms again in crystals on the outside of the wall.

The genus *Cribraria* is one of several in which no capillitium is present, but the upper part of the sporangium-wall consists of an open net through the meshes of which the spores escape.

It may be well to repeat what has been already stated, that in the sub-class *Endosporææ* the formation of spores takes place several hours after the sporangia have assumed their ultimate shape, and is immediately preceded by the division of the nuclei by karyokinesis, when each daughter-nucleus becomes the centre of a young spore. Here, as in the case of bipartition of the swarm-cells, true cell-formation takes place, and in both instances it is associated with karyokinetic division of the nucleus, whereas during the growth of the plasmodium the almost invariable rule appears to be that the nuclei increase in number by simple division.

The sub-class *Exosporææ* is represented by the single genus

*Ceratiomyxa*, and is characterised by the numerous white spores being borne on the outside of columnar or branching sporophores. These are delicate, fragile structures, often covering two or three square inches of the dead wood on which they grow. The surface of the sporophore is mapped out into polyhedral areolæ, from the centre of each of which arises a slender stalk bearing a single ellipsoid spore. On placing the ripe spores in water, the membranous spore-wall at once slips off, and the naked contents lie for several hours without apparent change, retaining their ellipsoid form. A constriction then takes place at right angles to the long axis, and before division is completed a second constriction of each half occurs; each of the four lobes thus formed again becomes constricted, and we have eight globular bodies adhering together and exhibiting slow amœboid movement; each of these bodies now produces a flagellum, and the cluster swims away by aid of the lashing flagella. In a short time the swarm-cells separate, and behave, so far as their history has been traced, in the same manner as those of the *Endosporea*. The colourless plasmodium inhabits the substance of rotten wood, and exhibits rhythmic streaming with the same intervals of time between the forward and backward flow as in the larger sub-class of the group.

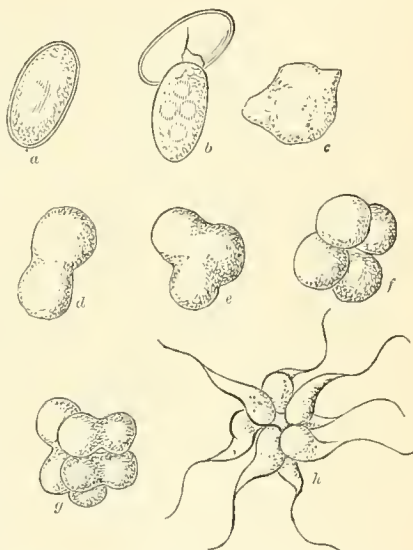


Fig. 8.—*CERATIOMYXA MUCIDA* Schroet.

- a. Spore.  
 b. Spore-contents escaping from the spore-wall.  
 c to g. Successive stages in the division of the naked spore into eight.  
 h. Cluster of eight swarm-cells.  
 Magnified 1200 times.

The Mycetozoa are remarkably cosmopolitan, a large number of species being found with identically the same characters in Europe, India, the Cape of Good Hope, Australia, and North and South America.

Of the hundred and seventy-five species which are represented in the British Museum collection, fifty-six have not yet been recorded from this country, and these have chiefly been obtained from the United States and the Tropics. During the last few years about thirty British species have been added to the list given in Cooke's "*Myxomycetes of Great Britain*," and it is probable that many more

will be discovered as fresh workers in different parts of the country take up the study.

The sporangia are found at all seasons of the year except in frosty and very dry weather, and every new locality that is searched affords abundant material, frequently including species of special interest which are rare elsewhere.

There is perhaps no group of organisms so easily within reach which offers at the present time so rich a reward to microscopic research.

## SYNOPSIS OF THE ORDERS AND GENERA OF THE BRITISH MYCETOZOA.

Sub-class I.—EXOSPOREÆ. Spores developed outside the sporophores.

Order I. — CERATIOMYXACEÆ. Sporophores membranous, branched; spores white, borne singly on filiform stalks arising from the areolated sporophore.

Genus 1.

*Ceratiomyxa* (p. 17).

Sub-class II.—ENDOSPOREÆ. Spores developed inside the sporangium.

Cohort I.—AMAUROSPORALES. Spores violet or violet-brown (ferruginous in *Stemonitis ferruginea* and *S. Smithii*).

Sub-cohort I. — CALCARINEÆ. Sporangia provided with lime (= calcium carbonate).

Order I.—PHYSARACEÆ. Lime in the form of minute innate granules.

A. Capillitium charged with lime throughout.

Genus 2.

*Badhamia* (p. 17).

B. Capillitium of hyaline threads with lime-knots (see Introduction, p. 12).

Genus 3. Sporangia single, sub-globose or plasmodiocarps; capillitium without free, hooked branches. *Physarum* (p. 18).

Genus 4. Sporangia forming an æthelium. *Fuligo* (p. 21).

Genus 5. Plasmodiocarps; capillitium with free, hooked branches. *Cienkowskia* (p. 21).

Genus 6. Sporangia goblet-shaped or ovoid; stalks cartilaginous. *Craterium* (p. 21).

Genus 7. Sporangia ovoid, shining, clustered; stalks membranous. *Leocarpus* (p. 22).

C. Capillitium without lime.

Genus 8. Sporangium-wall opaque. *Chondrioderma* (p. 22).

Genus 9. Sporangium-wall hyaline. *Diachaea* (p. 24).

Order II.—DIDYMIACEÆ. Lime in superficial crystals deposited outside the sporangium-wall.

Genus 10. Crystals stellate ; sporangia single.

*Didymium* (p. 24).

Genus 11. Crystals stellate ; sporangia forming an æthaliium.

*Spumaria* (p. 26).

Genus 12. Crystals lenticular.

*Lepidoderma* (p. 26).

Sub-cohort II.—AMAUROCHÆTINEÆ. Sporangia without lime.

Order I.—STEMONITACEÆ. Sporangia single, provided with a stalk and columella.

A. Sporangium-wall evanescent.

Genus 13. Capillitium spreading from the columella and forming a superficial net.

*Stemonitis* (p. 26).

Genus 14. Capillitium as above, but not forming a superficial net.

*Comatricha* (p. 27).

Genus 15. Capillitium springing from the apex of the sporangium.

*Encrthenema* (p. 28).

B. Sporangium-wall persistent.

Genus 16. Capillitium radiating from the columella.

*Lamproderma* (p. 28).

Order II.—AMAUROCHÆTACEÆ. Sporangia combined into an æthaliium.

Genus 17. Capillitium irregularly branched.

*Amaurochæte* (p. 30).

Genus 18. Capillitium with chambered vesicles.

*Brefeldia* (p. 30).

Cohort II.—LAMPROSPORALES. Spores variously coloured, not violet (except in *Cribraria violacea*).

Sub-cohort I. — ANEMINEÆ. Capillitium wanting, or not forming a system of uniform threads.

Order I. — HETERODERMACEÆ. Sporangium-wall membranous, beset with microscopic round plasmodic granules.

Genus 19. Sporangium-wall not forming a persistent net.

*Lindbladia* (p. 30).

Genus 20. Sporangium-wall forming a persistent net.

*Cribraria* (p. 31).

Genus 21. Sporangium-wall forming numerous parallel ribs.

*Dictydium* (p. 32).

Order II.—LICEACEÆ. Sporangium-wall cartilaginous.

Genus 22. Sporangia solitary, sessile.

*Licca* (p. 32).



Order III.—TUBULINACEÆ. Sporangium-wall membranous, without microscopic round granules.

Genus 23. Sporangia tubular, compacted. *Tubulina* (p. 32).

Order IV.—RETICULARIACEÆ. Sporangia combined into an æthallium, their walls incomplete, perforated, or forming a spurious capillitium.

Genus 24. Sporangia columnar. *Dictydiaethallium* (p. 33).

Genus 25. Sporangium-wall reduced to broad bands. *Enteridium* (p. 33).

Genus 26. Sporangium-walls laciniated. *Reticularia* (p. 33).

Sub-cohort II.—CALONEMINEÆ. Capillitium present; a system of uniform threads.

Order I.—TRICHIACEÆ. Capillitium of free elaters, or an elastic network with spiral thickenings.

Genus 27. Elaters free, spirals distinct. *Trichia* (p. 34).

Genus 28. Elaters scanty, spirals nearly wanting. *Oligonema* (p. 35).

Genus 29. Elaters combined into a web or network. *Hemitrichia* (p. 36).

Order II.—ARCYRIACEÆ. Capillitium a profuse network of threads (sometimes scanty in *Perichæna*), thickened with cogs, half rings, spines or warts.

Genus 30. Sporangia stalked, sporangium-walls evanescent above. *Arcyria* (p. 37).

Genus 31. Sporangia sessile, the walls single, persistent. *Lachnobolus* (p. 38).

Genus 32. Sporangia sessile, the walls double. *Perichæna* (p. 38).

Order III.—MARGARITACEÆ. Capillitium coiled, hairlike and solid, or straight and attached to the sporangium-wall.

Genus 33. Capillitium profuse, coiled. *Margarita* (p. 39).

Genus 34. Capillitium straight. *Dianema* (p. 39).

Genus 35. Capillitium penicillate, spirally banded. *Prototrichia* (p. 40).

Order IV.—LYCOGALACEÆ. Sporangia forming an æthallium; capillitium consisting of branched colourless tubes.

Genus 36. *Lycogala* (p. 40).

## MYCETOZOA. DE BARY.

[MYXOMYCETES. WALLROTH.]

## SUB-CLASS I.—EXOSPOREÆ.

## ORDER I.—CERATIOMYXACEÆ.

GENUS 1. **CERATIOMYXA** Schroeter.—Surface of sporophores mapped out into polyhedral areolæ, from the centre of each of which arises a slender stalk bearing a single ellipsoid spore.

1 **C. mucida** Schroeter.—Sporophores white or pinkish-yellow, forming either simple or branching tufts, or, in the variety *porioides*, a network resembling the pores of a *Polyporus*. Spores white, ellipsoid, smooth,  $10 \times 6$  to  $13 \times 7$   $\mu$  diam.

*Hab.* On rotten logs.

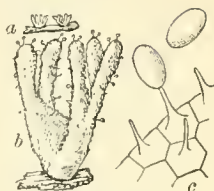


Fig. 9.  
**CERATIOMYXA MUCIDA** Schroet.  
a. Clusters of sporophores. Twice natural size.  
b. Sporophore. Magnified 40 times.  
c. Four areolæ of mature sporophore: one spore still attached to its stalk, and another free. Magnified 480 times.

## SUB-CLASS II.—ENDOSPOREÆ.

Cohort I.—**AMAUROSPORALES**.

Sub-cohort I.—**CALCARINEÆ**.

## ORDER 1.—PHYSARACEÆ.

GENUS 2. **BADHAMIA** Berkeley. — Sporangium-wall membranous, containing lime-granules; capillitium a coarse network charged throughout with granules of lime; spores clustered or free.



Fig. 10.  
**BADHAMIA UTRICULARIS** Berk.  
a. Cluster of sporangia. Magnified  $3\frac{1}{2}$  times.  
b. Fragment of capillitium and spore-cluster. Magnified 140 times.

1. **B. hyalina** Berk.—Sporangia globose or pyriform, usually sessile, 1 to 1.5 mm. diam., greyish-white. Capillitium of broad, branching, anastomosing bands, white. Spores dark purple-brown, adhering in clusters of 8 to 20, more strongly warted on the outer third, 11 to 13  $\mu$  diam.

*Hab.* On fir logs, etc.

2. **B. utricularis** Berk.—Sporangia ovoid, subglobose, or lobed, 0.5 to 1 mm. diam., clustered, with

membranous yellow branching stalks, or sessile, cinereous, or iridescent violet. Capillitium white. Spores bright brown, in loose clusters of 7 to 10, equally spinulose all over, 9 to 12  $\mu$  diam.

*Hab.* On old stumps, feeding on woody fungi.

3. *B. nitens* Berk.—Sporangia subglobose, crowded, sessile, 1 mm. diam., golden or greenish-yellow. Capillitium orange-yellow. Spores in close clusters of 6 to 10, purple-brown, coarsely warted on the outer third, 10 to 13  $\mu$  diam.

*Hab.* On rotten logs.

4. *B. macrocarpa* Rost.—Sporangia subglobose, sessile, or with firm stalks, gregarious, 0.5 to 1 mm. diam., white. Capillitium white. Spores free, dark purple-brown, minutely and closely spinulose, 11 to 15  $\mu$  diam.

*Hab.* On logs.

5. *B. panicea* Rost.—Sporangia subglobose, sessile, crowded, 1 mm. diam., white. Capillitium white, with occasional narrow hyaline threads. Spores free, violet-brown, nearly smooth, 11  $\mu$  diam.

*Hab.* On bark of felled elms, etc.

6. *B. lilacina* Rost.—Sporangia subglobose, sessile, crowded, 0.5 mm. diam., pale, flesh-coloured. Capillitium pale, flesh-coloured. Spores free, dark purple-brown, rough, with prominent and confluent warts, 11 to 13  $\mu$  diam.

*Hab.* On decayed stumps, bog moss, etc.

7. *B. rubiginosa* Rost.—Sporangia obovoid, stalked, gregarious, 0.5 mm. broad, rufous-brown, pale above, columella half the height of the sporangium. Capillitium pale rufous. Spores free, dark purplish-brown, usually rough, with prominent confluent warts, 11 to 13  $\mu$  diam.

*Hab.* In fir woods, on fallen brushwood, etc.

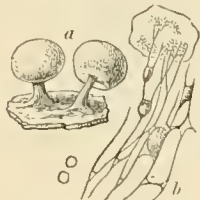


Fig. 11.

PHYSARUM NUTANS Pers.

a. Two sporangia. Magnified 9 times.

b. Capillitium threads, with lime-knots, attached to a fragment of the sporangium-wall. Magnified 110 times.

GENUS 3. **PHYSARUM** Persoon.—Sporangium-wall membranous, with innate deposits of lime, either in clusters of minute granules or compacted and chalky. Capillitium a network of delicate threads, with vesicular expansions filled with lime (= lime-knots).

1. *P. leucopus* Link.—Sporangia globose, gregarious, 0.5 mm. diam., glaucous-cinereous; stalk stout, chalk-white in section throughout. Capillitium white; lime-knots large. Spores violet-brown, nearly smooth, 7 to 10  $\mu$  diam.

*Hab.* On dead leaves, etc.



2. *P. murinum* Lister.—Sporangia subglobose, stalked or sessile, brown, 0.5 mm. diam. Stalk charged with lime throughout. Capillitium with brown lime-knots. Spores violet-brown, nearly smooth, 8 to 10  $\mu$  diam.

*Hab.* On dead wood, leaves, etc. Rare.

3. *P. citrinum* Schum.—Sporangia subglobose, gregarious, 0.4 to 0.7 mm. diam., yellow; stalk stout, yellow, charged with lime throughout. Capillitium rigid; lime-knots yellow. Spores violet-brown, almost smooth, 7 to 8  $\mu$  diam.

*Hab.* On dead wood, moss, etc.

4. *P. psittacinum* Ditm.—Sporangia subglobose, gregarious, 0.5 mm. diam., purple or metallic green mottled with red. Stalk orange-red, translucent. Capillitium with bright orange lime-knots. Spores dull violet, nearly smooth, 7 to 8  $\mu$  diam.

*Hab.* On old stumps.

5. *P. viride* Pers.—Sporangia subglobose, nodding, scattered, 0.5 mm. diam., yellow, greenish, or orange. Stalk subulate, translucent, containing refuse matter. Capillitium slender; lime-knots fusiform, orange. Spores violet-brown, nearly smooth, 7 to 10  $\mu$  diam.

*Hab.* On rotten stumps, etc. Common.

6. *P. nutans* Pers.—Sporangia subglobose, erect or nodding, gregarious, 0.4 to 1 mm. diam., pale grey. Stalk subulate, straw-coloured or dark, containing refuse matter. Capillitium slender; lime-knots small, white; spores violet-brown, nearly smooth, 8 to 11  $\mu$  diam.

Var. *leucophæum*. Sporangia erect, stalked, or plasmodiocarps stalks stouter. Capillitium more rigid; lime-knots larger.

*Hab.* On dead wood. Common.

7. *P. calidris* Lister.—Sporangia globose, scattered, 0.5 mm. diam., white. Stalk red, translucent. Capillitium-threads slender; lime-knots white; irregular in shape and size. Spores pale brownish-violet, nearly smooth, 8 to 11  $\mu$  diam.

*Hab.* On dead leaves, etc.

8. *P. compressum* Alb. and Schw.—Sporangia subglobose or lobed, compressed; stalked, sessile or plasmodiocarps, grey. Stalk dark or white, containing refuse matter. Capillitium-threads terete, flexuose; lime-knots white, numerous. Spores dark purplish-brown, spinulose, 9 to 14  $\mu$  diam.

*Hab.* Dead wood, bark, and leaves. A very variable species.

9. *F. didermoides* Rost.—Sporangia ovoid, erect, crowded, 0.5 mm. broad, white, diffused grey above. Stalk short, white, membranous. Capillitium flexuose; lime-knots numerous, rounded. Spores very dark purple-brown, nearly smooth, 10 to 13  $\mu$  diam.

*Hab.* On dead wood, leaves, etc.

10. **P. Crateriachea** Lister.—Sporangia white, rugose; either ovoid, erect, seated on an ochraceous hypothallus which is often produced into a short stalk, or forming plasmodiocarps. Capillitium a rigid network of hyaline threads; lime-knots confluent in the centre of the sporangium, and forming an elongate clavate pseudocolumella, sparsely distributed elsewhere. Spores purple-brown, spinulose,  $8\ \mu$  diam.

*Hab.* On rotting herbaceous stems. Rare.

11. **P. cinereum** Pers.—Sporangia sessile, subglobose, or plasmodiocarps, scattered or crowded,  $0.3$  to  $0.5$  mm. diam., pale-grey. Capillitium with numerous white lime-knots. Spores violet-brown, nearly smooth,  $7$  to  $10\ \mu$  diam.

*Hab.* On dead leaves, etc.

12. **P. bivalve** Pers.—Sporangia sessile, elongate, laterally compressed, frill-like, splitting longitudinally, white or buff. Capillitium of numerous white lime-knots connected by short hyaline threads. Spores violet-brown, spinulose,  $8$  to  $10\ \mu$  diam.

*Hab.* On dead leaves, etc.

13. **P. Diderma** Rost.—Sporangia sessile, subglobose, or elongate, sometimes compressed, plasmodiocarps,  $0.6$  mm. or more wide; the white outer sporangium-wall peeling off and disclosing the purplish inner layer. Capillitium with numerous white lime-knots. Spores purplish-brown, spinulose,  $10$  to  $12\ \mu$  diam.

*Hab.* On dead leaves, etc.

14. **P. contextum** Pers.—Sporangia sessile, obovoid, or reniform, curved, crowded,  $0.5$  mm. diam., ochraceous, the wall densely calcareous. Capillitium of numerous branching white lime-knots with short connecting threads. Spores dark violet-brown, spinulose,  $10$  to  $13\ \mu$  diam.

*Hab.* On dead leaves, etc.

15. **P. conglomeratum** Rost.—This species resembles *P. contextum* in general appearance, but differs in the spores, which are pale violet-brown, nearly smooth,  $8$  to  $10\ \mu$  diam.

*Hab.* On dead leaves, etc.

16. **P. virescens** Ditm.—Sporangia sessile, irregularly ovoid,  $0.2$  to  $0.3$  mm. diam., much aggregated in confluent groups, rugose, yellowish-green. Capillitium delicate flexuose, lime-knots yellow. Spores pale violet-brown, nearly smooth,  $6$  to  $9\ \mu$  diam.

Var. **obscurum**. Sporangia more scattered, smooth, olive-brown, often forming plasmodiocarps,  $0.5$  mm. diam.

*Hab.* On dead leaves, etc.

17. **P. rubiginosum** Fries.—Sporangia sessile, subglobose,  $0.5$  mm. diam., orange or deep red. Capillitium with branching orange lime-knots. Spores pale violet-brown, nearly smooth,  $8$  to  $11\ \mu$  diam.

*Hab.* On dead wood and leaves. Rare.

GENUS 4. **FULIGO** Haller.—Æthelium consisting of interwoven anastomosing sporangia enclosed by a barren cortex.

1. **F. septica** Gmel.—Æthelium pulvinate, from 2 mm. to 20 cm. broad, yellow, sometimes cinereous or reddish. Sporangium-walls within the æthelium containing scattered innate deposits of lime. Capillitium of hyaline threads with yellow or whitish lime-knots. Spores violet, nearly smooth, 6 to 10  $\mu$  diam.

*Hab.* On rotten wood, tan, etc. Common.

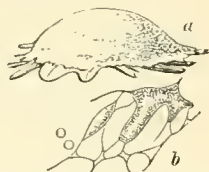


Fig. 12.—**FULIGO SEPTICA** Gmel.  
a. Æthelium. One-third natural size.

b. Capillitium threads with lime-knots and two spores. Magnified 120 times.

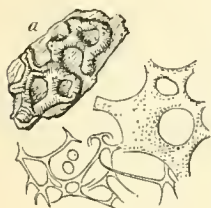


Fig. 13.

**CIENKOWSKIA RETICULATA**  
Rost.

a. Part of branching plasmodiocarp. Magnified 4 times.

b. Capillitium threads and part of a perforated lime-plate. Magnified 140 times.

GENUS 5. **CIENKOWSKIA** Rostafinski.—Sporangium-wall cartilaginous at the base. Capillitium a loose network of rigid threads, with many free, curved, sharp-pointed branchlets, connected with flat perforated calcareous plates attached at their margins to the sporangium-wall.

**C. reticulata** Rost.—Plasmodiocarps cylindrical winding, 0.5 mm. diam., usually anastomosing and forming a net, yellow-brown, blotched with crimson. Capillitium-threads yellow, the calcareous plates pale yellow. Spores violet-brown, minutely spinulose, 9 to 11  $\mu$  diam.

*Hab.* On dead wood. Rare.

GENUS 6. **CRATERIUM** Trentepohl.—Sporangia stalked, goblet-shaped or ovoid, usually dehiscing with a distinct lid; sporangium-wall charged with granules of lime, cartilaginous in the lower part, thinner above. Capillitium containing large lime-knots usually confluent in the centre of the sporangium as a pseudo-columella.

1. **C. pedunculatum** Trent.—Sporangia smooth, goblet-shaped, with a pale lid. Capillitium with many large white lime-knots. Spores violet-brown, nearly smooth, 8 to 9  $\mu$  diam.

*Hab.* On dead leaves. Common.

2. **C. leucocephalum** Ditm.—Sporangia top-shaped or ovoid, stalked, red-brown, white and mealy, with sprinkled yellow granules

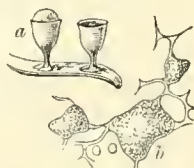


Fig. 14.

**CRATERIUM PEDUNCULATUM**  
Trent.

a. Two sporangia; in one the lid has fallen away. Magnified 10 times.

b. Capillitium with lime-knots and two spores. Magnified 110 times.

on the upper half and lid. Capillitium with large white or yellowish lime-knots. Spores violet-brown, spinulose, 7 to 9  $\mu$  diam.

*Hab.* On dead leaves.

3. *C. mutabile* Fr.—Sporangia ovoid, stalked, without a distinct lid, rough, yellow, the wall thin, with innate clusters of yellow lime granules. Capillitium with pale yellow lime-knots. Spores violet-brown, spinulose, 8 to 9  $\mu$  diam.

*Hab.* On dead leaves.



Fig. 15.

LEOCARPUS VERNICOSUS Link.

a. Cluster of sporangia. Magnified  $2\frac{1}{2}$  times.

b. Hyaline threads and branching lime-knot of the capillitium, with two spores. Magnified 120 times.

GENUS 7. *LEOCARPUS* Link.—Sporangium-wall uniform, of two layers; the outer cartilaginous and calcareous, shining; the inner hyaline. Capillitium of two systems, one a network of hyaline threads, the other of coarse anastomosing branches charged with brownish lime-granules.

1. *L. vernicosus* Link.—Sporangia ellipsoid, crowded, chestnut-brown, shining as if varnished, with short membranous stalks. Capillitium as in the genus. Spores violet-brown, 11 to 13  $\mu$  diam.

*Hab.* On dead leaves, etc.

GENUS 8. *CHONDRIODERMA* Rostafinski.—Sporangium-wall of two layers, containing granular deposits of lime. Capillitium without lime-knots.

Sub-genus 1. *Euchondrioderma*.—Sporangia mostly sessile, the outer wall a smooth crust composed of globular lime-granules, the inner membranous.

1. *C. spumarioides* Rost.—Sporangia subglobose, sessile, crowded on a profuse hypothallus, white; the two layers of the wall usually adhering. Columella convex, pale. Capillitium of slender flexuose purplish threads. Spores violet-brown, minutely spinulose, 8 to 11  $\mu$  diam.

*Hab.* On dead leaves, etc.

2. *C. globosum* Rost.—Differs from *C. spumarioides* in the outer layer of the sporangium-wall separating more freely from the inner, and in the larger, darker, more spinulose spores, 10 to 14  $\mu$  diam.

*Hab.* On dead leaves, etc.

3. *C. testaceum* Rost.—Sporangia subglobose, sessile on a broad base, dull or pale flesh-coloured; the eggshell-like outer wall of the

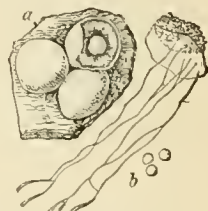


Fig. 16.

CHONDRIODERMA TESTACEUM Rost.

a. Group of three sporangia; in the upper one the double wall is broken away in part and the columella exposed. Magnified 9 times.

b. Portion of the outer and inner layers of the sporangium-wall; to the latter the capillitium threads are attached: three spores. Magnified 170 times.

sporangium separating from the inner. Columella large, hemispherical, reddish-brown. Capillitium as in the last species. Spores pale violet-brown, nearly smooth, 7 to 8  $\mu$  diam.

*Hab.* On dead leaves, etc.

4. **C. Michelii** Rost.—Sporangia disc-shaped, on a stout, pale, ochraceous, central stalk, rarely sessile, chalk-white. Columella indefinite. Capillitium and spores as in *C. testaceum*.

*Hab.* On dead leaves, etc.

5. **C. reticulatum** Rost.—Differs from *C. Michelii* in the shape of the sporangia only, which are flat plasmodiocarps, often branching and forming a net.

*Hab.* On dead leaves, etc.

6. **C. niveum** Rost.—Sporangia subglobose, or plasmodiocarps, white; the outer layer of the sporangium-wall thick, the inner membranous. Columella broad, convex, orange. Capillitium dark, somewhat rigid, warted. Spores violet-brown, minutely spinulose, 9 to 11  $\mu$  diam.

*Hab.* On dead leaves, etc.

Sub-genus 2. *Leangium*.—Sporangia mostly stalked; sporangium-wall often dehiscing in revolute lobes; of two inseparable layers, the outer cartilaginous, charged with minute granules of lime, the inner membranous.

7. **C. Trevelyani** Rost.—Sporangia roundly ovoid, stalked or sessile; chestnut-brown. The sporangium-wall differs from that in all other species of the sub-cohort *Calcarineæ* in being constructed of an outer, cartilaginous brown layer, a thick middle layer consisting of white crystalline calcareous deposits, and a delicate membranous inner layer, to which the ends of the capillitium are attached. Columella none. Capillitium a network of purple threads, with dark thickenings at the nodes. Spores dark violet-brown, spinulose, 10 to 12  $\mu$  diam.

*Hab.* On dead leaves, etc.

8. **C. Sauteri** Rost.—Sporangia subglobose, depressed, sessile, pale pinkish-brown; outer layer of sporangium-wall cartilaginous, brittle, separating from the membranous inner layer. Columella indistinct. Capillitium of sparingly branched, colourless or violet threads, 2 to 3  $\mu$  diam. Spores dark violet-brown, spinulose, 10 to 13  $\mu$  diam.

*Hab.* On dead wood, moss, etc. Rare.

9. **C. radiatum** Rost. Sporangia subglobose, umbilicate beneath, usually with a short, stout stalk, pale grey or brownish; sporangium-wall cartilaginous, obscurely granular, with an inseparable membranous inner layer. Columella hemispherical. Capillitium violet-brown, rigid, sparingly branched; spores dark violet-brown, minutely spinulose, 9 to 12  $\mu$  diam.

*Hab.* On bark, twigs, etc.



10. *C. floriforme* Rost.—Sporangia globose, white or cinnamon; sporangium-wall dehiscing on drying in revolute lobes. Stalks longer than in the last species. Columella ovoid. Capillitium of slender violet-brown threads with bead-like thickenings. Spores red-violet-brown, with widely scattered obtuse warts, 9 to 11  $\mu$  diam.

*Hab.* On oak stumps, etc.

11. *C. lucidum* Cooke.—Sporangia subglobose, brown, shining; sporangium-wall of two layers, but without deposits of lime. Columella prominent, roundish, stalked. Capillitium of few, broad, branching, purplish-brown threads; spores dark purple-brown, closely spinulose, 12 to 14  $\mu$  diam.

*Hab.* On moss. Trefriw, N. Wales. A doubtful species.

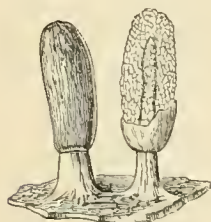


Fig. 17.

*DIACHÆA ELEGANS* Fries.

Two sporangia, the one entire, the other deprived of the spores and showing capillitium and columella. Magnified 22 times.

GENUS 9. *DIACHÆA* Fries.—Lime not present either in the membranous sporangium-wall or in the network of purple capillitium, but in the stalk and columella only.

1. *D. elegans* Fries. — Sporangia cylindrical, iridescent purple; stalk white. Columella narrowing upwards, white, giving rise to the closely branching capillitium. Spores dull violet, nearly smooth, 7 to 9  $\mu$  diam.

*Hab.* On dead leaves.

## ORDER II.—DIDYMIACEÆ.

GENUS 10. *DIDYMIUM* Schrader. — Sporangia stalked or sessile; lime-crystals either scattered on the membranous sporangium-wall, or closely combined and forming a crust; capillitium often thickened at intervals with dark nodes.

1. *D. difforme* Duby.—Sporangia hemispherical, on a broad yellowish base, or plasmodiocarps, white; lime-crystals minute, densely combined to form a smooth, eggshell-like crust, often separating from the iridescent inner sporangium-wall. Columella none. Capillitium scanty, the threads broad at the base, branched above. Spores dark purple-brown, nearly smooth, 11 to 14  $\mu$  diam.

*Hab.* On dead leaves. Common.

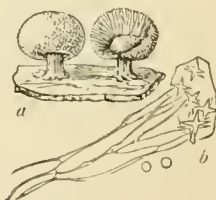


Fig. 18.

*DIDYMIUM EFFUSUM* Link.

- a. Two sporangia, one entire, the other showing columella and capillitium. Magnified 12 times.  
b. Capillitium and fragment of sporangium-wall, with crystals of calcium carbonate and two spores. Magnified 200 times.

2. **D. dubium** Rost.—Sporangia thin, flat, roundish, white; lime-crystals stellate, adhering to form a frosted crust often extending beyond the margin of the broad membranous base of the sporangium. Columella none. Capillitium profuse, of rigid purple-brown, erect anastomosing threads, slender above and below. Spores violet-grey, nearly smooth, 8 to 15  $\mu$  diam.

*Hab.* On dead leaves.

3. **D. Serpula** Fr.—Sporangia thin, effused, grey plasmodiocarps. Columella none. Capillitium of slender threads connected with large scattered purplish vesicles, 20 to 50  $\mu$  diam., filled with yellowish granular matter. Spores pale violet-brown, nearly smooth, 7 to 9  $\mu$  diam.

*Hab.* On dead leaves, etc.

4. **D. Clavus** Rost.—Sporangia disc-like, grey, on a darker central stalk; in shape resembling a flat-headed nail. Columella none. Capillitium profuse. Spores pale violet-brown, almost smooth, 6 to 8  $\mu$  diam.

*Hab.* On dead leaves.

5. **D. farinaceum** Schrad. —Sporangia hemispherical, deeply umbilicate beneath, grey; sporangium-wall mottled with brown. Stalk and broad columella dark opaque-brown. Capillitium of coarse pale or dark threads. Spores dark purplish-grey, nearly smooth, 9 to 11  $\mu$  diam.

Var. **minus** is smaller, with short stalks and slender capillitium; spores 7 to 9  $\mu$  diam.

*Hab.* On dead leaves, bark, etc.

6. **D. nigripes** Fr.—Distinguished from *D. farinaceum*, var. *minus*, in the stalk being longer and more slender, and in being horn-clear instead of opaque and granular.

Var. **xanthopus** Fr. has an orange stalk and white columella.

*Hab.* On dead leaves.

7. **D. effusum** Link. —Sporangia very various, subglobose, hemispherical, stalked, sessile, or effused plasmodiocarps, white or grey; the stellate crystals adhering to form a wrinkled crust, or scattered; stalk short, white, opaque, sometimes orange. Columella white. Capillitium colourless or dark. Spores violet-brown, spinulose, 8 to 11  $\mu$  diam.

*Hab.* On dead leaves.

8. **D. crustaceum** Fr.—Distinguished from *D. effusum* by the sporangia being often clustered and reniform, and by their being enclosed in a thick, smooth, fragile, globose crust of loosely adhering large crystals, and in the more strongly spinulose spores, 10 to 13  $\mu$  diam.

*Hab.* On dead leaves, etc.

GENUS 11. **SPUMARIA** Persoon.—Sporangia confluent, forming an æthaliium enclosed in a mass of white lime-crystals; the other characters as in *Didymium*.

1. *S. alba* DC.—Sporangia elongate and lobed, usually penetrated by a hollow columella. Capillitium much branched. Spores dull purple, strongly spinulose, 10 to 13  $\mu$  diam.

*Hab.* On grass, dead leaves, etc.



Fig. 19.—SPUMARIA ALBA DC.

a. Æthaliium. Natural size.  
b. Capillitium and fragment of sporangium-wall, with crystals of calcium carbonate and two spores. Magnified 200 times.

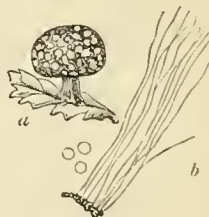


Fig. 20.

LEPIDODERMA TIGRINUM Rost.

a. Sporangium. Magnified 6 times.  
b. Capillitium and spores. Magnified 140 times.

GENUS 12. **LEPIDODERMA** de Bary.—Sporangium-wall cartilaginous, beset with superficial crystalline discs or scales. Capillitium usually rigid.

1. *L. tigrinum* Rost.—Sporangia subglobose, flattened beneath, dull olive, crystalline discs white. Stalk and hemispherical columella dull orange. Capillitium threads purple. Spores dark purplish-grey, minutely spinulose, 8 to 13  $\mu$  diam.

*Hab.* On bark, etc.

Sub-cohort II.—**AMAUROCHÆTINEÆ**.

ORDER I.—**STEMONITACEÆ**.

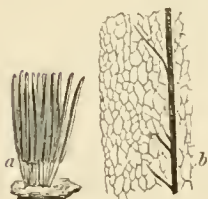


Fig. 21.

STEMONITIS SPLENDENS Rost.

a. Group of sporangia. Natural size.  
b. Portion of capillitium and columella. Magnified 42 times.

GENUS 13. **STEMONITIS** Gleditsch.—Sporangia cylindrical, stipitate, fasciculate; stalk continued as a columella to near the apex of the sporangium. Capillitium radiating from all parts of the columella, the ultimate branches normally uniting to form a superficial net.

1. *S. fusca* Roth.—Sporangia dark or reddish-brown, 4 to 15 mm. high. Superficial net of the capillitium with angular meshes varying in size from less than to three times the width of the spore.



Spores grey, or rufous-violet, closely reticulate and spinulose, 6 to 10  $\mu$  diam.

Var. **confluens** is an æthalioid form without superficial net or columellæ.

*Hab.* On dead wood. Common.

2. **S. splendens** Rost.—Distinguished from *S. fusca* by the large rounded meshes of the capillitium net, from three to fifteen times the width of the spores, and by the almost smooth, reddish-purple spores, 7 to 9  $\mu$  diam., which, when magnified 1200 times, are seen to be minutely and closely warted.

Var. **flaccida** has slender, weak stalks, and the meshes of the net very wide and broken.

*Hab.* On dead wood.

3. **S. ferruginea** Ehrenb.—Sporangia cinnamon-brown, 5 to 7 mm. high. Meshes of the capillitium net as in *S. fusca*, but the threads more slender. Spores pale ferruginous, nearly smooth, 8 to 9  $\mu$  diam. Plasmodium yellow.

*Hab.* On dead wood.

4. **S. Smithii** Macbr.—Distinguished from *S. ferruginea* by the longer sporangia and minute spores, 4 to 6  $\mu$  diam. Plasmodium white.

*Hab.* On dead wood.

#### GENUS 14. COMATRICHA Preuss.—

Sporangia subglobose or cylindrical, stalked, gregarious. Capillitium as in *Stemonitis*, except that it is more dense, and the ultimate branches do not unite to form a superficial net.

1. **C. obtusata** Preuss.—Sporangia globose, ellipsoid, or cylindrical, purple-brown. Total height, 1 to 6 mm. Stalks slender. Capillitium a dense tangle of purplish-brown threads; ultimate branches usually looped. Spores brownish-violet, nearly smooth, 7 to 11  $\mu$  diam.

*Hab.* On dead wood. Common.

2. **C. laxa** Rost.—Distinguished from *C. obtusata* by the lax capillitium, and by the branches spreading from the columella in a more straight and radiating direction.

*Hab.* On dead wood.

3. **C. lurida** Lister.—Sporangia globose, purple-brown. Stalk setaceous, 0.75 mm. long. The purple-brown flexuose capillitium spreads from the upper half of the branching columella, which reaches to half the height of the sporangium. Spores purplish-grey, warted, 8 to 10  $\mu$  diam.

*Hab.* On dead leaves. Hitherto only found at Lyme Regis.



Fig. 22.

COMATRICHA OBTUSATA Preuss.

a. Group of sporangia. Natural size.

b. Sporangium deprived of spores showing the capillitium. Magnified 16 times.

4. *C. typhoides* Rost.—Sporangia shortly cylindrical, brown after the disappearance of the silvery evanescent sporangium-wall. Columella reaching to near the apex of the sporangium. Capillitium a close network of pale-brown flexuose threads with many free ends. Spores pale violet-brown, almost smooth, 4 to 7  $\mu$  diam.

*Hab.* On rotten wood.

5. *C. Persoonii* Rost.—Sporangia cylindrical or clavate, rufous-brown, including the stalk about 1 mm. high; columella nearly reaching the apex. Capillitium dense, of flexuose brown threads, the ultimate branches looped, with few free ends. Spores pale lilac-brown, minutely warted, 6 to 8  $\mu$  diam.

*Hab.* On dead leaves.

6. *C. rubens* Lister.—Sporangia subglobose or pyriform, pinkish-brown, including the stalk about 1.5 mm. high. Columella branched above, and reaching two-thirds the height of the sporangium. Capillitium brownish-violet, branching from all parts of the columella, with slender free ends. The lower branches have broad attachments to the lower part of the sporangium-wall, which forms a persistent cup. Spores as in *C. Persoonii*.

*Hab.* On dead leaves.

GENUS 15. **ENERTHENEMA** Bowman.—Sporangia stipitate; columella reaching to the summit of the sporangium. Capillitium springing from beneath the superficially extended apex of the columella.

1. *E. elegans* Bowm.—Sporangia globose, black. Capillitium threads long, sparingly branched. Spores greyish-brown, spinulose, 8 to 10  $\mu$  diam.

*Hab.* On dead wood.

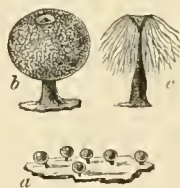


Fig. 23.

*ENERTHENEMA ELEGANS* BOWMAN.

a. Group of sporangia. Twice the natural size.

b. Sporangium. Magnified 16 times.

c. Sporangium deprived of spores, showing the capillitium. Magnified 16 times.



Fig. 24.

*LAMPRODERMA IRIDEUM* MASS.

a. Group of sporangia. Magnified 2½ times.

b. Sporangium deprived of spores, showing capillitium. Magnified 25 times.

GENUS 16. **LAMPRODERMA** Rostafinski.—Sporangia globose or ellipsoid, stipitate; sporangium-wall somewhat persistent, shining

with iridescent colours. Capillitium of branching and anastomosing threads radiating from the upper part of the columella.

1. **L. physaroides** Rost.—Height of sporangium with the stalk 2 to 3 mm.; sporangium ovoid or globose. Columella subclavate, reaching to more than half the height of the sporangium. Capillitium of purple-brown threads, straight and sparingly branched below, springing from the upper half of the columella. Spores purple-grey, closely spinulose, 11 to 14  $\mu$  diam.

A sessile form occurs without a columella.

*Hab.* On fir wood.

2. **L. echinulatum** Rost.—Total height 2 to 2.5 mm. Sporangia globose. Columella cylindrical, obtuse, half the height of the sporangium. Capillitium lax; of nearly straight, sparingly forked, black, strong threads with pale tips, springing from the upper part of the columella. Spores dark grey, echinulate with black spines, 15 to 20  $\mu$  diam.

*Hab.* On dead wood.

3. **L. arcyrionema** Rost.—Total height 1 to 1.5 mm. Sporangia globose, 0.5 mm. diam. Columella half the height of the sporangium, slender, smooth to the apex, where it divides into the primary branches of the black, crisped capillitium. Spores lilac-grey, smooth, 6 to 7  $\mu$  diam.

*Hab.* On dead wood.

4. **L. irideum** Mass.—Total height 1 to 1.5 mm. Sporangia globose, on setaceous stalks. Columella cylindrical, half the height of the sporangium. Capillitium of rigid, dichotomously-branched, blackish threads, which are colourless at the base, where they are attached to the truncate apex of the columella. Spores marked with minute, not crowded warts, 6.5 to 8  $\mu$  diam.

*Hab.* On dead leaves. Common.

5. **L. violaceum** Rost.—Total height, 0.6 to 1.5 mm. Sporangia subglobose on setaceous or thicker stalks. Columella one-third to two-thirds the height of the sporangium. Capillitium white and flaccid, or brown and dense. Spores purplish-grey or purple-brown, closely spinulose, 8 to 11  $\mu$  diam.

Var. **Sauteri** is a robust form; stalks thickened below; capillitium brown; spores 11 to 15  $\mu$  diam.

*Hab.* On sticks, dead leaves, etc.

A variable species, sometimes resembling forms of *L. irideum*, but distinguished by the spores. These, when highly magnified, are seen to be marked with closely set, often very minute spines, and not with the more distant warts characteristic of that species.

## ORDER II.—AMAUROCHÆTACEÆ.

GENUS 17. **AMAUROCHÆTE** Rostafinski.—Æthalia pulvinate,



Fig. 25.  
AMAUROCHÆTE ATRA Rost.

a. Æthalium. Half natural size.  
b. Capillitium. Magnified 10 times.

composed of elongate confluent sporangia; sporangium-walls not developed; capillitium rising from the base in irregularly flattened and ragged strands, rarely forming a more regular network.

1. *A. atra* Rost.—Æthalium black, covered with a silvery evanescent membrane. Capillitium black, often very scanty. Spores dull purple, spinulose, 11 to 13  $\mu$  diam.

*Hab.* On fir wood.

GENUS 18. **BREFELDIA** Rostafinski.—Æthalia pulvinate, composed of subcylindrical, branched, and confluent sporangia. Capillitium of numerous horizontal threads, those of adjacent sporangia uniting on the boundary line and there forming a many-chambered vesicle.

1. *B. maxima* Rost.—Æthalia sometimes many inches across, purplish-brown. Capillitium brown. Spores purplish-brown, minutely spinulose, 9 to 12  $\mu$  diam.

*Hab.* On dead wood.

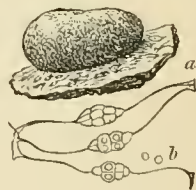


Fig. 26.  
BREFELDIA MAXIMA Rost.

a. Æthalium. Natural size.  
b. Capillitium and spores. Magnified 50 times.

## Cohort II.—LAMPROSPORALES.

## Sub-cohort I.—ANEMINEÆ.

## ORDER I.—HETERODERMACEÆ.

GENUS 19. **LINDBLADIA** Fries.—Sporangia either combined to form an æthalium or closely compacted on a strongly-developed hypothallus.

1. *L. Tubulina* Fries.—Æthalia thin or pulvinate, formed of confluent sporangia with persistent membranous walls; either black and rugose, with a cortex of imperfectly developed spores, or umber-brown with a surface of unbroken sporangia. Spores ochraceous-brown, nearly smooth, 4 to 6  $\mu$  diam.

*Hab.* On dead wood.

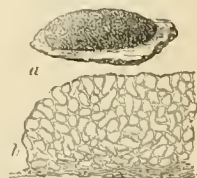


Fig. 27.  
LINDBLADIA TUBULINA Fries.

a. Æthalium. Natural size.  
b. Vertical section of æthalium. Magnified 6 times.

GENUS 20. **CRIBRARIA** Persoon.—Sporangia globose, stalked; sporangium-wall persistent and usually forming a cup in the lower half, continued above in a net of slender threads more or less thickened at the nodes, evanescent in the meshes. Spores nearly smooth.

1. **C. argillacea** Pers.—Sporangia shortly stalked, sometimes sessile, crowded, clay-coloured; sporangium-wall subpersistent throughout, cup imperfectly defined; net usually continued to the base, nodes scarcely thickened. Spores ochraceous,  $5\ \mu$  diam.

*Hab.* On dead wood.

2. **C. rufescens** Pers.—Sporangium rufous-brown, with a cup one-third its height distantly toothed on the margin; net wide-meshed, threads firm, nodes scarcely thickened. Stalk as long as the sporangium, black. Spores pale yellowish-red,  $6\ \mu$  diam.

*Hab.* On dead fir wood.

3. **C. macrocarpa** Schrad.—Sporangia robust,  $0\cdot6$  to  $0\cdot8$  mm. diam., nut-brown; the cup marked with numerous longitudinal ribs and perforated towards the deeply toothed margin, which merges into an irregular net with branching nodes. Spores ochraceous,  $5\ \mu$  diam.

*Hab.* On dead fir wood.

4. **C. aurantiaca** Schrad.—Sporangium nut-brown, with a cup one-third its height, deeply toothed on the margin; net with slender threads and flat, angular, branching nodes. Stalk two to four times the length of the sporangium, dark brown. Spores ochraceous,  $5\ \mu$  diam.

*Hab.* On dead fir wood.

5. **C. intricata** Schrad.—Sporangium ochraceous-brown, with a cup one-third its height, or wanting; the net close, delicate, regular; nodes numerous, small, prominent, often branched, dark brown, with many free rays. Stalk long, subulate. Spores ochraceous,  $5\ \mu$  diam.

*Hab.* On dead wood.

6. **C. tenella** Schrad.—Differs from *C. intricata* in the nodes of the net being round and without free rays.

*Hab.* On dead wood.

7. **C. pyriformis** Schrad.—Sporangium brittle, purplish-brown, with a cup one-third its height; net with brownish-yellow firm threads, and dark, somewhat triangular, nodes; these and the yellowish sporangium-wall are densely beset with large purple-brown plasmodic granules,  $2\ \mu$  diam. Stalk dark purple-brown. Spores pinkish-ochre,  $5\ \mu$  diam.

*Hab.* On dead wood.



Fig. 28.  
**CRIBRARIA AURANTIACA**  
Schrad.

- a. Group of sporangia. Twice natural size.  
b. Sporangium after dispersion of the spores. Magnified 20 times.

8. *C. violacea* Rex.—Sporangium minute, about 0·2 mm. diam., dark violet, on a long stalk; the membranous cup violet-blue, one to two-thirds the height of the sporangium; net of delicate threads connecting the broad, flat, angular nodes. Spores lilac, minutely warted,  $7\ \mu$  diam.

*Hab.* On fir wood.

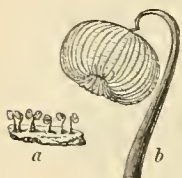


Fig. 29.

*Dictydium umbilicatum*  
Schr.

- a.* Group of sporangia. Twice natural size.  
*b.* Sporangium after the dispersion of spores. Magnified 20 times.

GENUS 21. *Dictydium* Schrad.—Sporangium-wall with parallel ribs extending from the base to the apex, connected by slender transverse threads.

1. *D. umbilicatum* Schrad.—Sporangia globose, becoming umbilicate above, dark red-brown. Stalk bent or twisted at the slender apex. Spores pale red-brown, 4 to  $7\ \mu$  diam., with two or three purple plasmodic granules on the spore wall.

*Hab.* On dead wood.

## ORDER II.—LICEACEÆ.

GENUS 22. *Licea* Schrad.—Sporangia sessile. Sporangium-wall cartilaginous. Capillitium wanting.

1. *L. flexuosa* Pers.—Plasmodiocarps elongate, dark brown. Spores pale olive-brown, spinulose, sometimes in clusters of six or eight, 11 to  $14\ \mu$  diam.

*Hab.* On dead wood.



Fig. 30.

*Licea flexuosa* Pers.

- a.* Group of plasmodiocarps. Twice natural size.  
*b.* Plasmodiocarp. Magnified 6 times.  
*c.* Spores. Magnified 200 times.

## ORDER III.—TUBULINACEÆ.

GENUS 23. *Tubulina* Persoon.—Sporangia tubular, compacted. Capillitium wanting.



Fig. 31.

*Tubulina fragiformis* Pers.  
Cluster of sporangia. Magnified  $2\frac{1}{2}$  times.

1. *T. fragiformis* Pers.—Sporangia cylindrical, crowded on a spongy hypothallus, forming a rounded honeycomb-like rufous-brown mass. Spores pale rufous-brown, reticulate, 5 to  $8\ \mu$  diam.

*Hab.* On dead wood.



## ORDER IV.—RETICULARIACEÆ.

GENUS 24. **DICTYDIÆTHALIUM** Rostafinski.—Æthaliium flat, formed of erect columnar sporangia. Sporangium-wall incomplete, dome-shaped on the top, continued down to the hypothallus in four to six straight threads.

1. **D. plumbeum** Rost.—Æthaliium dull slate or clay coloured, minutely areolated with the convex apices of the sporangia. Spores pale yellow, spinulose, 9 to 12  $\mu$  diam.

*Hab.* On dead wood.

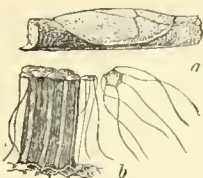


Fig. 32.  
**DICTYDIÆTHALIUM PLUMBEUM**  
Rost.

a. Æthaliium. Natural size.

b. Eight sporangia of an æthaliium isolated; in three the column of spores has fallen away, leaving the cap and persistent threads. Magnified 20 times.

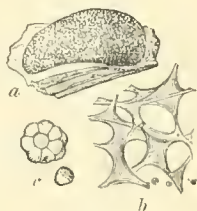


Fig. 33.  
**ENTERIDIUM OLIVACEUM**  
Ehrenb.

a. Plasmodiocarp. Magnified twice.

b. Part of spurious capillitium. Magnified 35 times.

c. A spore cluster, and one isolated spore. Magnified 210 times.

GENUS 25. **ENTERIDIUM** Ehrenberg.—Æthaliium composed of confluent interwoven sporangia, their walls perforated with large openings.

1. **E. olivaceum** Ehrenb.—Æthaliium pulvinate, olive-brown; sporangium-walls yellow-olive. Spores in clusters of 6 to 20, sometimes free, pale olive, warted on one side, 9 to 12  $\mu$  diam.

*Hab.* On dead wood.

GENUS 26. **RETICULARIA** Bulliard.  
—Æthalia composed of interwoven sporangia; the persistent portion of their walls rusty brown, forming broad membranous folds and strands, dividing above into narrow threads.

1. **R. Lycoperdon** Bull.—Æthaliium pulvinate, 2 to 6 cm. diam., at first enclosed by a silvery cortex. Spores pale rusty-brown, closely reticulate on one side, 6 to 8  $\mu$  diam.

*Hab.* On stumps. Common.

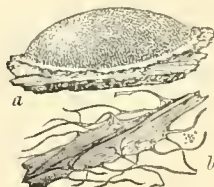


Fig. 34.  
**RETICULARIA LYCOPERDON**  
Bull.

a. Æthaliium. Natural size.

b. Fragment of capillitium. Magnified 100 times.

2. **R. lobata** Lister.—Æthalia small, about 0·5 mm. across, subrotund or lobed, depressed, crowded or clustered, iridescent rusty-brown. Spores rusty-brown, sharply reticulated, 6 to 10  $\mu$  diam.

*Hab.* On stumps, fir and chestnut.

Sub-cohort II.—*CALONEMINEÆ*.

ORDER I.—*TRICHIACEÆ*.

GENUS 27. **TRICHIA** Haller.—Sporangia stalked or sessile; elaters free, pointed at each end, thickened with two to five spiral bands.

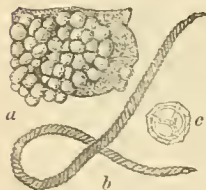


Fig. 35.  
*TRICHIA AFFINIS* de Bary.

- a. Group of sporangia. Twice natural size.  
b. Elater. Magnified 250 times.  
c. Spore. Magnified 400 times.

1. **T. favoginea** Pers.—Sporangia yellow, clavate or globose, crowded, sessile, seldom shortly stalked. Elaters 7  $\mu$  diam. with 5 spiral bands. Spores yellow, 13 to 15  $\mu$  diam., widely reticulate with deep, narrow bands, giving a border about 2  $\mu$  wide.

*Hab.* On fir stumps.

2. **T. verrucosa** Berk.—Sporangia yellow, pyriform, stalked, gregarious or solitary. Stalks 0·7 mm. long; in foreign gatherings they are sometimes 2 mm. long and combined in clusters. Elaters 5  $\mu$  diam. with 3 to 5 spiral bands. Spores 13 to 15  $\mu$  diam., reticulate with shallow, narrow bands, giving a border 1  $\mu$  wide.

*Hab.* On fir bark.

3. **T. affinis** de Bary.—Sporangia yellow, globose, crowded, sessile. Elaters 5  $\mu$  diam., with 4 to 5 spiral bands. Spores 13 to 15  $\mu$  diam., reticulated with shallow pitted bands giving a border 1  $\mu$  wide.

*Hab.* On stumps. Common.

4. **T. persimilis** Karst.—Sporangia yellow-brown, globose, crowded, sessile. Elaters 4·5  $\mu$  diam., with 4 to 5 spiral bands, spinulose. Spores yellow-brown, 11 to 14  $\mu$  diam., with the reticulation broken into irregular, shallow, pitted warts; border interrupted.

*Hab.* On stumps. Common.

5. **T. scabra** Rost.—Sporangia orange-yellow, globose, crowded, sessile. Elaters 5  $\mu$  diam., with 4 to 5 irregular spiral bands, often spinose. Spores yellow, 10  $\mu$  diam., closely warted or minutely reticulate.

*Hab.* On stumps. Common.

6. **T. varia** Pers.—Sporangia ochraceous, globose or turbinate, crowded or scattered, sessile or on short dark stalks. Elaters 4  $\mu$



diam., with 2 spiral bands. Spores ochraceous, minutely warted,  $13\ \mu$  diam.

*Hab.* On dead wood. Common.

7. **T. contorta** Rost.—Sporangia yellow-brown, subglobose or curved, gregarious or scattered, sessile; sporangium-wall charged with granular matter. Elaters yellow or brown, 3, rarely  $5\ \mu$  diam., with 4 close, often indistinct, spiral bands; the tips usually swollen and ending in a curved point. Spores yellow, minutely warted,  $12\ \mu$  diam.

*Hab.* On dead wood.

8. **T. erecta** Rex.—Sporangia dark brown, reticulate with bright yellow, broad veins, which are free from granular deposits, turbinate, stalked, scattered. Elaters often very long,  $4\ \mu$  diam., with four close spiral bands, spinulose. Spores yellow, minutely warted,  $12\ \mu$  diam.

*Hab.* On dead wood.

This species is closely allied to *Hemitrichia intorta*.

9. **T. fallax** Pers.—Sporangia turbinate, stalked, gregarious, shining olive-brown. Stalk hollow, filled to the base with spores. Elaters brown, tapering into long slender points; spiral bands 4 to 5. Spores yellow-brown, minutely warted, 9 to  $12\ \mu$  diam.

*Hab.* On dead wood. Common.

10. **T. Botrytis** Pers.—Sporangia turbinate, stalked, gregarious, simple or combined in clusters, purplish-brown, often reticulate with yellow veins, or black. Stalk dark brown, solid. Elaters brown, tapering into long slender points; spiral bands 3 to 5. Spores ochraceous, minutely spinulose, 9 to  $11\ \mu$  diam.

*Hab.* On dead wood.

Var. **lateritia**.—Elaters pale burnt-sienna, with shorter points. Spores orange-yellow.

*Hab.* On dead wood.

Var. **flavicoma**.—Sporangia minute, solitary; elaters and spores bright yellow.

*Hab.* On dead leaves, holly, etc.

#### GENUS 28. **OLIGONEMA** Rostafinski.

—Sporangia minute, densely clustered, sessile. Elaters scanty, with spiral bands obscure.

1. **O. nitens** Rost.—Sporangia subglobose,  $0.3\ \text{mm.}$  diam., heaped together, shining, yellow. Elaters usually few, short, obtuse, sometimes longer and pointed; spiral markings faint or wanting. Spores 11 to  $16\ \mu$  diam., yellow, reticulate, with a border  $1\ \mu$  wide.

*Hab.* On dead wood.



Fig. 36.

**OLIGONEMA NITENS** Rost.

- a. Cluster of sporangia. Magnified 3 times.
- b. Elater. Magnified 280 times.
- c. Spore. Magnified 400 times

GENUS 29. **HEMITRICHIA** Rostafinski.—Sporangia stalked or sessile; capillitium an elastic network of branching threads thickened with spiral bands.



Fig. 37.  
**HEMITRICHIA RUBIFORMIS**  
Lister.

a. Cluster of sporangia. Magnified  $2\frac{1}{2}$  times.

Capillitium. Magnified 280 times.

c. Spore. Magnified 400 times.

1. **H. rubiformis** Lister.—Sporangia subcylindrical, crowded, or in clusters of 6 to 12, with crumpled, membranous, empty stalks, red-brown or olive-black. Capillitium-threads orange-red, with 3 to 5 regular spiral bands, strongly spinose. Spores pale orange-red, minutely warted,  $10\ \mu$  diam.

*Hab.* On dead wood.

2. **H. intorta** Lister.—Sporangium turbinate, yellow, on a short, dark, solid stalk. Sporangium-wall granular, the inner layer usually smooth. Capillitium-threads orange-yellow, twisted, spinulose, with 4 or 5 close, more or less distinct, spiral bands. Spores yellow, minutely warted,  $10\ \mu$  diam.

Var. **leiotricha**.—Spirals on elaters indistinct or nearly wanting. Spores 12 to  $13\ \mu$  diam.

*Hab.* On dead wood and leaves.

3. **H. clavata** Rost.—Sporangia turbinate, stalked, shining, ochraceous-yellow. Stalk cylindrical, dark, hollow, filled with spores. Capillitium-threads yellowish-olive, with 5 or 6 well-defined bands arranged in an elongated spiral. Spores ochraceous, minutely warted, 8 to  $10\ \mu$  diam.

*Hab.* On dead wood.

4. **H. Karstenii** Lister.—Sporangia curved or branched plasmodiocarps, or globose. Except that the capillitium-threads are combined into a network, this species agrees with *Trichia contorta*.

*Hab.* On dead wood.

5. **H. Serpula** Rost.—Plasmodiocarps winding or forming a net, golden yellow. Capillitium-threads yellow, with 3 to 5 well-marked spiral bands, strongly spinose. Spores yellow, 10 to  $12\ \mu$  diam., reticulate with narrow bands, giving a border  $1\ \mu$  diam.

*Hab.* On dead wood.

6. **H. chrysospora** Lister.—Sporangia subglobose, sessile, crowded, bright yellow. Capillitium-threads yellow, with 4 or 5 close spiral bands. Spores yellow, 14 to  $18\ \mu$  diam., neatly reticulated with deep, narrow bands, giving a border 1 or  $2\ \mu$  wide.

*Hab.* On fallen larch. Rare.

A form occurs with free elaters.

## ORDER II.—ARCYRIACEÆ.

GENUS 30. **ARCYRIA** Hill.—Sporangia stalked; sporangium-wall persistent below as a membranous cup; stalks filled with spores or spore-like cells; capillitium forming an elastic network.

1. **A. ferruginea** Sauter.—Sporangia turbinate, crowded, orange-red, rarely ochraceous; the cup reticulated with smooth, round-meshed thickenings. Capillitium-threads yellow-brown, free from the cup, subtriangular in section, thickened with transverse bands and spines on one side, with broken reticulation on the other. Spores ochraceous, minutely warted, 9 to 11  $\mu$  diam.

*Hab.* On dead wood. Distinguished by its large spores.

2. **A. albida** Pers.—Sporangia ovoid, pale grey. Capillitium colourless or yellowish, attached to the cup; threads minutely and closely warted, or spinulose, the central threads usually smooth. Spores nearly smooth, 6 to 7  $\mu$  diam.

Var. **pomiformis**.—Sporangia globose, yellow.

*Hab.* On dead wood and sticks. Common.

3. **A. punicea** Pers.—Sporangia ellipsoid or conico-cylindrical, crimson, crowded. Capillitium attached to the cup, threads thickened with half-rings, cogs or spines arranged in a loose spiral. Spores nearly smooth, 7  $\mu$  diam.

*Hab.* On rotten wood. Common.

4. **A. incarnata** Pers.—Sporangia shortly cylindrical, flesh-colour, crowded. Stalks short. Capillitium free from the cup; the threads with few or many free clavate ends; the thickenings as in *A. punicea*, but usually more spinulose. Spores nearly smooth, 7  $\mu$  diam.

*Hab.* On dead wood, sticks, etc. Common.

5. **A. flava** Pers.—Sporangia cylindrical, ochraceous, crowded. Capillitium free from the cup, expanding into a drooping column many times the length of the sporangium; threads beset with sharp spines and half-rings, arranged in a loose spiral. Spores nearly smooth, 7  $\mu$  diam.

*Hab.* On rotten wood.

6. **A. Ærstedtii** Rost.—Differs from *A. flava* in being dull crimson in colour, and in the slender threads being more evenly spinulose.

*Hab.* On fir wood.

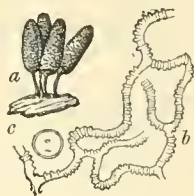


Fig. 38.

ARCYRIA PUNICEA Pers.

- a. Group of sporangia. Twice natural size.
- b. Capillitium. Magnified 250 times.
- c. Spore. Magnified 560 times.

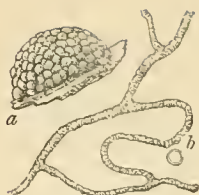


Fig. 39.  
LACHNOBOLUS CIRCINANS Fries.  
a. Cluster of sporangia. Twice  
natural size.  
b. Capillitium and spore. Mag-  
nified 300 times.

GENUS 31. **LACHNOBOLUS** Fries.—Sporangia sessile clustered. Capillitium a loose network of threads attached to many parts of the single persistent sporangium-wall.

1. **L. circinans** Fries.—Sporangia subglobose, shining ochraceous-brown; sporangium-wall membranous, firm, papillose. Capillitium of freely branching ochraceous-yellow threads, closely and equally beset with prominent warts. Spores pale yellow, almost smooth, 6 to 8  $\mu$  diam.

*Hab.* On dead wood.

GENUS 32. **PERICHAENA** Fries.—Sporangium-wall of two layers, the outer thickened with dark granules which are exceptionally absent in the upper part. Capillitium of slender branching threads minutely warted or spinose.

1. **P. chrysosperma** Lister.—Sporangia curved or ring-shaped plasmodiocarps, sometimes subglobose, brown; sporangium-wall subcartilaginous, with external granular deposits. Capillitium profuse, bright yellow, sparingly branched threads beset with numerous straight or curved spines as long as the diameter of the thread. Spores citron-yellow in mass, nearly smooth, 9 to 10  $\mu$  diam.

*Hab.* On bark, etc.

2. **P. depressa** Libert.—Sporangia depressed, polygonal, crowded, brown, dehiscing with a well-defined lid; outer layer of the sporangium-wall cartilaginous, inner membranous. Capillitium a web of branching slender yellow threads, 2  $\mu$  diam., minutely warted and constricted. Spores yellow, nearly smooth, about 10  $\mu$  diam.

*Hab.* On bark, etc.

3. **P. populina** Fries.—Sporangia subglobose, depressed, crowded, purple-brown or grey, dehiscing with a well-defined lid. Capillitium usually scanty, sometimes reduced to only a few simple or branched free threads. Essentially distinguished from *P. depressa* by the larger spores, about 13  $\mu$  diam.

*Hab.* On bark, etc.

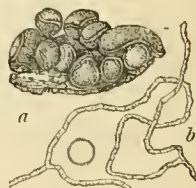


Fig. 40.  
PERICHAENA POPULINA Fries.  
a. Group of sporangia. Magni-  
fied 7 times.  
b. Capillitium and spore. Mag-  
nified 280 times.

4. **P. variabilis** Rost.—Sporangia curved or netlike plasmodiocarps, sometimes globose, scattered, yellow or umber; outer layer of sporangium-wall charged with dark, angular granules, and closely combined with the membranous, minutely papillose inner layer. Capillitium a profuse web of yellow threads, rough with minute warts and constrictions. Spores yellow, nearly smooth, 10 to 13  $\mu$  diam.

*Hab.* On dead leaves, wood, etc.

### ORDER III.—MARGARITACEÆ.

GENUS 33. **MARGARITA** Lister.—Sporangia globose, with a translucent wall. Capillitium a profuse coil of slender, hair-like, scarcely branching threads.

1. **M. metallica** Lister.—Sporangia mostly solitary, pearl-grey or copper colour, iridescent. Capillitium of very long grey threads about 1  $\mu$  broad. Spores almost colourless, nearly smooth, 10 to 11  $\mu$  diam.

*Hab.* On dead leaves and rotten planks.



Fig. 41.

**MARGARITA METALLICA** Lister.

a. Two sporangia. Magnified 6 times.

b. Part of a long capillitium thread, and a spore. Magnified 250 times.

GENUS 34. **DIANEMA** Rex.—Sporangia sessile; sporangium-wall membranous. Capillitium consisting of nearly straight threads, slender at both ends, attached above and below to the sporangium-wall.



Fig. 42.

**DIANEMA DEPRESSUM** Lister.

a. Plasmodiocarp. Magnified twice.

b. Capillitium attached above and below to the walls of the sporangium. Magnified 50 times.

c. Spore. Magnified 560 times.

1. **D. Harveyi** Rex.—Sporangia pulvinate or curved plasmodiocarps, 1 mm. diam., dull red or bronze. Capillitium-threads erect, simple except at the ends where they are attached by several branches to the sporangium-wall. Spores pale yellowish, ochraceous or brick-red in mass, nearly smooth, 8 to 10  $\mu$  diam.

*Hab.* On dead wood.

2. **D. depressum** Lister. Sporangia pulvinate, depressed, 2 to 10 mm. wide, at first shining violet, maturing to grey-brown. Capillitium-threads slender, rigid, forking and uniting at the opposite ends, attached above and below to the sporangium-wall by suddenly acuminate tips. Spores yellowish-grey, closely reticulate when highly magnified, 6 to 8  $\mu$  diam.

*Hab.* On dead wood.



Fig. 43.  
PROTOTRICHIA FLAGELLIFERA  
Rost.

- a. Group of sporangia. Magnified 4 times.  
b. Capillitium attached above to a fragment of the sporangium-wall, and a spore. Magnified 280 times.

GENUS 35. **PROTOTRICHIA** Rostafinski.—Sporangia globose. Capillitium rising from the base of the sporangium in stout strands marked with spiral thickenings, branching at length into a pencil of slender threads attached at the tips to the upper parts of the sporangium-wall.

1. **P. flagellifera** Rost. Sporangia sessile, crowded or scattered, rarely stalked, brown or pinkish-brown, shining. Capillitium pale olive or brown. Spores pale pinkish-brown in mass, nearly smooth, 10 to 11  $\mu$  diam.

*Hab.* On dead sticks, etc.

#### ORDER IV.—LYCOGALACEÆ.

GENUS 36. **LYCOGALA** Micheli.—Æthalia subglobose, with a cortex consisting of two or more closely combined layers, and provided with cell-like vesicles. Capillitium tubes thick-walled where they traverse the cortex; thin-walled amongst the spores. Spores in mass pale pinkish-grey.

1. **L. flavo-fuscum** Rost.—Æthalia subpyriform, brown, smooth, minutely areolate and mottled; the cortex thick, of three layers, the middle one consisting of an aggregation of yellow vesicles. Capillitium branching and anastomosing. Spores minutely reticulate, 5 to 6  $\mu$  diam.

*Hab.* On dead wood.

2. **L. miniatum** Pers.—Æthalia subglobose, crowded or scattered, at first rose-red, maturing to pale yellowish-brown, minutely warted; cortex with the vesicles arranged superficially. Spores minutely reticulate, 5 to 7  $\mu$  diam.

*Hab.* On dead wood. Common.

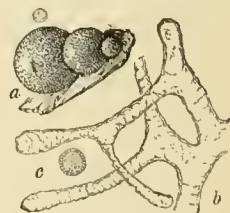


Fig. 44.  
LYCOGALA MINIATUM Pers.

- a. Three æthalia. Natural size.  
b. Capillitium. Magnified 150 times.  
c. Spore. Magnified 600 times.



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